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UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT OF APPLIED PHYSICS AND ENGINEERING MATHEMATICS

EMERGENCY MEDICAL CARE

MODULE: PHY1DA1
COURSE: PHYSICS 1
CAMPUS: DFC

JUNE EXAMINATION 2016

DATE 07/06/2016 **SESSION: 08:30 - 10:30**

ASSESSOR **DR S.P. BVUMBI**

INTERNAL MODERATOR **MR T.G. MATHE**

DURATION 2 HOURS **MARKS 101**

NUMBER OF PAGES: 9 PAGES INCLUDING DATA SHEET

INSTRUCTIONS:
- **Answer all the questions**
- **Calculators are permitted**
- **Answer SECTION A in the answer book provided**
- **Answer SECTION B on UJ multiple choice grid provided**
- **Write your surname and initials on the multiple choice grid**

SECTION A – answer in full

QUESTION 1 **[14]**

1.1 Define or state

1.1.1 acceleration (2)

1.1.2 the law of conservation of momentum (3)

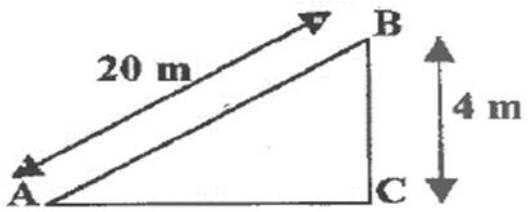
1.1.3 the watt (3)

1.2 A ball thrown vertically upward falls back in the hand after 8 s. How high did the ball go? (3)

1.3 A motorcycle decelerates uniformly from 30 m s^{-1} to 14 m s^{-1} in 16 s. Calculate the deceleration of the motorcycle. (3)

QUESTION 2 **[18]**

2.1 A body, mass 5 kg, initial velocity 10 m s^{-1} is projected up a frictionless inclined plane for 20 m, as shown in the figure below.



Calculate :

2.1.1 the kinetic energy at A (3)

2.1.2 the potential energy at B (3)

2.1.3 the kinetic energy at B (5)

2.1.4 the velocity at B (4)

2.2 What power must a girl expend to raise a 0,5 kg book vertically at a speed of 0,6 m s^{-1}? (3)

QUESTION 3 **[11]**

State or define

3.1. Archimedes principle (3)

3.2. law of Boyle in words **AND** write the mathematical formula (4)

3.3. density (2)

3.4. pressure (2)

QUESTION 4 **[8]**

4.1 A pressure gauge in a submarine shows a total pressure of 1200 kPa. If atmospheric pressure is 100 kPa and the density of sea water is $1,2 \times 10^3$ kg m^{-3}. Calculate the depth of the submarine. (4)

4.2 A partially inflated balloon contains 500 m^3 of helium at 27 °C and a pressure of 1 atm. What is the volume of the helium when the pressure is 0,5 atm and the temperature is -3 °C (4)

[Total Section A = 51]

SECTION B – multiple choice

1. Which one of the following is not an SI base unit ?

   A. meter

   B. second

   C. centimeter

   D. kilogram

2. The prefix kilo (k) is represented by which power of ten?

   A. 10^{-3}

   B. 10^{6}

   C. 10^{3}

   D. 10^{-6}

3. The surface of a lake has an area of 15,5 km^2. What is the area of the lake in m^2?

   A. $1{,}55 \times 10^{4}\ m^2$
   B. $1{,}55 \times 10^{3}\ m^2$
   C. $1{,}55 \times 10^{6}\ m^2$
   D. $1{,}55 \times 10^{7}\ m^2$

4. Which of the following choices is equivalent to 8 mm^3?

   A. $8 \times 10^{-3}\ m^3$
   B. $8 \times 10^{-9}\ m^3$
   C. $8 \times 10^{-6}\ m^3$
   D. $8 \times 10^{9}\ m^3$

5. Of the given quantities time; velocity; displacement and acceleration, the one that does not fit is

   A time, because it is the only scalar quantity
   B acceleration, because it is the only one with direction
   C displacement, because it is the only vector quantity
   D velocity, because it is the only one with a derived unit

6. The resultant vector is

   A. that single vector that closes a vector triangle
   B. that single vector that balances the other vectors
   C. that single vector that replace all the other vectors
   D. obtained by adding the sizes of all the vectors

7. When an unbalanced force acts on a body, the body

   A will accelerate
   B experience a change in velocity
   C experience a change in its state of inertia
   D all of the above

8. According to Newton's second law of motion, the acceleration of a body is

   A never constant
   B directly proportional to the body's mass
   C inversely proportional to the mass of the body
   D inversely proportional to the size of the force causing it

9. What is the tension in a rope suspending a 20 kg object?

   A 20 N
   B 200 N
   C 0 N
   D 100 N

10. The rate at which work is done is measured in

    A joule
    B newton-meter
    C seconds
    D watt

11. An object start from rest and accelerates at 11 m s^{-2}.How long will it take to acquire a velocity of 48,4 m s^{-1} ?

    A 44 s
    B 14 s
    C 400 s
    D 4,4 s

12. A stone is thrown downward from a height of 32 m. If it reaches the ground after 2 s, calculate its initial velocity

    A 0,6 m s^{-1}
    B 6 m s^{-1}
    C 16 m s^{-1}
    D 60 m s^{-1}

13. Calculate the work done by a 30 kN force displacing an object 50 cm in the force's direction

    A 15000 J
    B 1500 J
    C 15 J
    D 150 MJ

14. How much work is required to change the speed of a 1000 kg car from 5 m s^{-1} to 8 m s^{-1}?

    A 12500 J
    B 32000 J
    C 44500 J
    D 19500 J

15. The relative density of a substance is 5. This means that the

    A mass per unit volume of the substance is 5
    B density of the substance compared to the density of pure water at 4 °C is 5
    C density of the substance compared to the mass of an equal volume of water is 5
    D mass of the substance compared to an equal volume of water is 5

16. A liquid has a relative density of 0,357. What is its density?

A 357 kg m^{-3}
B 643 kg m^{-3}
C 0,357 kg m^{-3}
D 3570 kg m^{-3}

17. The mass of a gold ring (RD = 19,3) of volume 8 x 10^{-6} m^3 is

A 154,4 kg
B 154 000 g
C 2,4 g
D 154,4 g

18. The mass of an RD bottle filled with water is 200 g, whilst filled with oil of relative density 0,8 the mass is 170 g. The mass of the empty bottle is

A 30 g
B 50 g
C 24 g
D 94 g

19. One of the laws for pressure in liquids is Pascal's principle which states that

A the pressure in a liquid is independent of the shape or size of the container
B the change in pressure on a confined fluid is transmitted unchanged throughout the fluid
C a force of 1 N acting uniformly and perpendicularly on a 1 m^2 area causes a pressure of 1 Pa
D the pressure in a liquid at the same depth is the same in all directions

20. The pressure exerted by an object is 8 kPa. This means that

A the object weighs 8 kN
B the object has a mass of 8000 kg
C the object's weight of 8 kN is evenly distributed over its base area
D if the base area of the object is 1 m^2, its weight would be 8 kN

21. Amonton's law for an enclosed mass of gas is only valid if the

A volume of the gas stays constant
B temperature of the gas remains fixed

C pressure of the gas remains fixed
D gas is at STP

22. Convert a pressure of 70 cm Hg to a pressure in kPa

A 93,3 kPa
B 70 kPa
C 933 kPa
D 9,3 kPa

23. A gas is confined in a cylinder of constant volume. At 0 °C the pressure of the gas is 100 kPa. Calculate the temperature (in °C) if the pressure is 10 kPa. (2 marks)

A -245.7 °C
B 27,3 °C
C 27,3 K
D -245,7 K

24. Convection is a process of heat transfer taking place in

A solids only
B both solids and liquids
C liquids only
D both liquids and gases

[25 x 2 = 50]

Total = 101
100 % = 100